Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)
	)
1998 Biennial Regulatory Review --	) **ET Docket No. 98-80**
Conducted Emission Limits Below 30 MHz	)
For Equipment Regulated Under Parts 15	)
and 18 of the Commission's Rules	)

To: The Commission

COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED IN RESPONSE TO NOTICE OF INQUIRY

The American Radio Relay League, Incorporated (the League), the national association of amateur radio operators in the United States, by counsel and pursuant to Section 1.415 of the Commission's Rules [47 C.F.R. §97.415], hereby respectfully submits its comments in response to the *Notice of Inquiry* released June 8, 1998 by the Commission (FCC 98-102) in the captioned proceeding. For its comments, the League states as follows:

1. The Notice proposes to analyze, as part of a comprehensive review of all of its rules in conjunction with its biennial regulatory review process, the extent to which unlicensed electronic devices regulated under Part 15 of the Commission's rules, and Industrial, Scientific and Medical Devices regulated under Part 18 of the Commission's Rules, are permitted to conduct RF voltages onto the AC power line on frequencies below 30 MHz. Conducted RF energy is a particularly significant concern in the high-frequency (HF) range due to the efficiency of the AC power lines as antennas, given the long wavelengths of the frequencies at issue. Conducted emissions are of particular concern to the Amateur Radio Service, given: (1) the extremely heavy use of the amateur allocations spaced throughout the HF spectrum, and (2)

the geographic proximity of amateur stations, generally operated from residences, to the AC power lines, and to Part 15 and 18 devices.

2. The Commission notes that it has been several years since the last review of the conducted emissions limitations. The Commission rewrote its Part 15 regulations in 1989[1] and at that time consolidated the conducted emission limitations for all devices. The Commission stated at that time:

> Consistent with our objective to eliminate, to the extent possible, device-specific regulations, we proposed to apply a single limit of 250 uV for all intentional and unintentional radiators, except for Class A digital devices (footnote omitted). This limit would apply over the frequency range 450 kHz to 30 MHz. We indicated that we believed such a limit would be sufficient to ensure that Part 15 devices do not cause interference to authorized services operating in that range irrespective of the type of modulation or emission used...A few commenting parties object to the conducted limits proposed in the *Notice*. For example, TV receiver manufacturers indicate that even through the limit proposed to be applied to their equipment is a higher value than under the existing rules, the use of a 50 ohm/50 uH LISN and measurement instrumentation employing a quasi-peak detector results in a lower emission limit. The comments indicate that tighter limits are not required since TV receivers and similar devices have never been sources of interference. Other comments request an increase in the permitted levels for conducted emissions, especially for Class A digital devices. However, the comments submitted by individual operators in the Amateur Radio Service (ARS) and by individuals who regularly listen to international broadcast stations (shortwave) indicate that devices such as TV receivers and computers are major sources of interference in the frequency bands below 30 MHz and argue for more stringent conducted emissions limits.
>
> ...The interference potential of Part 15 devices below 30 MHz is controlled principally by the limit placed on conducted emissions. We believe that the limits proposed in the *Notice* will provide sufficient flexibility to design cost-effective equipment. Further, based on past experience with these limits, we believe that

---

[1] See the *First Report and Order* in Docket 87-389, 4 FCC Rcd. 3493 (1989), especially paragraphs 18-19.

they are sufficient to alleviate many of the interference problems currently being encountered. Therefore, we are adopting the limits which were proposed in the *Notice...*

Id., 4 FCC Rcd at 3496

The Commission adopted a ten-year transition period to implement this regulation for receivers, and a five-year transition plan for other devices. Therefore, the transition period for receivers has not yet been concluded. The transition period for other devices concluded in 1994. Part 18 conducted emissions limitations were most recently reviewed in 1985.[2]

3. The current conducted emission limitation for Part 15 devices (both intentional and unintentional radiators) on frequencies between 450 kHz and 30 MHz is 250 microvolts, except that for Class A digital devices operating in the vicinity of the AM Broadcast band, the limit is 1 millivolt, and on HF frequencies, 3 millivolts.[3] Conducted emissions from Part 18 devices are governed by Section 18.307 of the Commission's rules, and the limits are device-specific. The most liberal regulation applies to non-consumer RF lighting devices, which are permitted conducted emissions in the 1.6 to 30 MHz range of up to 3 millivolts. Relative to conducted emissions by Part 18 RF lighting devices, the League has most recently submitted comprehensive comments[4] in response to the Commission's *Notice of Proposed Rule Making* in ET Docket No. 98-42, 63 Fed. Reg. 20362 (released April 9, 1998). Those comments are incorporated herein by reference to the extent relevant to conducted emissions from RF lighting devices.

4. Apparently, the Commission's decision to reexamine the Parts 15 and 18 conducted

---

[2] See General Docket 20718, and particularly the *Third Report and Order*, 58 RR 2d 1096 (1985).

[3] See 47 C.F.R. §§15.107 (unintentional radiators), 15.207 (intentional radiators).

[4] See the Comments of the *American Radio Relay League, Incorporated*, filed July 8, 1998.

emission limitations is based, at least in part, on its proceeding governing RF lighting devices. However, different devices, given their varied operating environments, have necessarily different interference potential. Paragraph 9 of the Notice states that the Commission tentatively believes that some limitations continue to be necessary for controlling interference to licensed radio services operating in the HF range. The League wholeheartedly agrees. The HF bands allocated to the Amateur Radio Service are extensively used for worldwide communications around the clock, using extremely sensitive receivers and high-gain antenna systems. The communications conducted include public service and emergency communications. Severe interference is noted regularly at amateur stations in HF bands due to conducted RF energy caused by microwave ovens, television receivers, Class B computing devices, and numerous consumer Part 15 devices. The League agrees with the Commission's observation that there have been no changes in technology that would inherently control conducted emissions from Part 15 and Part 18 equipment. There are unlikely to be any such changes absent regulatory requirements, given the absence of any relationship between the performance of a Part 15 or Part 18 device and its conducted emissions. For that same reason, there is no incentive on the part of the operator of the device, or the manufacturer, to control the conducted emissions therefrom.

5. Thus, the League would conclude that the Part 15 and 18 conducted emission limitations are very much necessary. There appears no alternative means of controlling interference to licensed radio services operating in the HF bands. After the point of sale, the owners of these devices have no incentive to cease operating the devices upon interference complaints from radio amateurs, and candidly, experience leads to the inevitable conclusion that the Commission cannot be relied upon for any practical assistance in enforcing its non-

interference rules relative to Part 15 and Part 18 devices. Therefore, the Commission's regulation of conducted limits of such devices prior to point of sale is urgently necessary. The general interference prohibition contained in the Part 15 rules does not work in practice. Most of the customer support offered by manufacturers who sell to consumers occurs at the retail level. The typical retailer of consumer equipment does not even know that Part 15 and Part 18 regulations exist, nor are they aware what the legal responsibilities of the operator of Part 15 and Part 18 devices are. It would be most inappropriate to consider relaxing Part 15 and Part 18 absolute limits unless and until the consumer electronics industry is provably able to properly respond to the interference problems that occur under the present regulations.

6. The Commission asks whether the existing Part 15 and 18 limitations are effective in controlling interference to services operating below 30 MHz. In general, the current rules are not sufficient to prevent instances of interference from conducted emissions from Part 15 and Part 18 devices to amateur radio stations. The number of reported anecdotal instances of such interference is not so consistently high as to suggest that the limits need be reduced below present levels. However, the number of such complaints is largely reflective of the adaptability of radio amateurs to RF interference, not an indication of the absence of such interference. Indeed, on an empirical basis, there has been observed by the League over the past ten years a marked increase in RF noise from conducted emissions generally, due to the proliferation of Part 15 and 18 devices in residential areas. The League does not believe that it would be appropriate to effect any rules changes that would relax the conducted emissions limits for Part 15 and Part 18 devices. The present conducted emission limits do not protect the Amateur Radio Service against harmful interference from Part 15 and Part 18 devices. The number of new devices that

can cause interference has been steadily increasing, significantly increasing the interference potential. This would generally indicate that more restrictive regulations, not less regulation, would be required to maintain the same, minimal protection offered by the present rules.

7. The Notice asks whether there have been any changes in the types of radio services operating below 30 MHz that warrant a change in conducted emissions limits. With respect to the Amateur Service, there have been few changes in its use of the HF bands, save for an increase in digital communications modes. However, even with the error-correction inherent in many amateur radio data communications modes, conducted emissions in the HF bands stand to disrupt significantly all types of amateur communications due to the sensitivity of amateur HF receivers.

8. The Notice, at Paragraph 11, asks whether changes or advancements in analytical interference models dictate adjustments in conducted emissions limits, and whether there are specific types of devices that should be regulated differently. The League is unaware of any measurement techniques that would justify any change in the conducted emissions limitations applicable to the HF bands. To permit the wide range of radio services and devices to coexist with the wide, and growing, range of consumer devices, it is essential that both radiated and conducted emissions of all significant emitters be closely regulated. In general, the costs associated with meeting these regulations is less than the cost that would be associated with the effects of harmful interference that would result without regulation. The incremental cost savings that would result from a relaxation in the conducted emission requirements would be minimal.

9. The Commission correctly notes that many radio devices are connected to the AC mains. It also correctly notes that the AC wiring in common use in residential and commercial

installations can, in some cases, act very efficiently as antennas. The League's laboratory staff has modeled several simple AC wiring configurations, using EZNEC Pro antenna-modeling software, with a NEC-4 calculation engine. It was found that typical AC wiring can function efficiently as an antenna when differential-mode signals are coupled onto it, with antenna gains reported by NEC-4 over the range of -45 dBi to about +2 dBi. As additional configurations are modeled, the League expects to see some installations exhibit even higher gains.

10. As the Commission correctly notes, most compliance testing with the present regulations is done using a LISN, to facilitate testing in systems that can have wide-ranging, complex impedances. These LISN devices and typical measurement techniques usually measure differential-mode signals. In addition, some devices can generate common-mode conducted emissions as well. These common-mode signals will generally be radiated very efficiently by AC wiring, much more efficiently than typical differential-mode signals. As the issue of conducted emission limits is being revisited in this proceeding, the Commission should consider whether it should clarify in the present regulations that both common-mode and differential-mode emissions should be regulated and tested for compliance.

11. In summary, the League agrees with the Commission that conducted emission limits remain necessary for controlling interference to radio services operating below 30 MHz. The League notes, however, that the present limits do not protect the Amateur Radio Service from harmful interference. For that reason, the League cannot support any relaxation of conducted emission limits in the HF bands. To the contrary, the League has noted an aggregate increase in RF noise from conducted RF emissions in the HF bands, which would indicate that the conducted limits should be made more stringent, although it is recognized that manufacturers

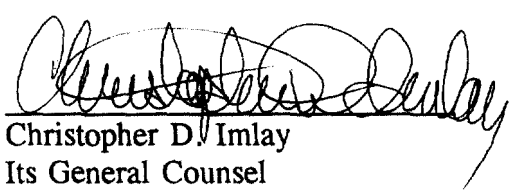
have relied on the current limitations in designing products for some time now. Because interference from Part 15 and Part 18 devices to HF authorized services results principally from conducted emissions, it is especially important that the Commission retain what minimal protection exists from the present regulations thereon. Finally, the League agrees with the Commission's finding that regulations pertaining to conducted emission limits do not impede the development of new technology.

Therefore, the foregoing considered, the American Radio Relay League, Incorporated respectfully requests that the Commission retain the present conducted emission limits in Parts 15 and 18 of its rules, without change.

Respectfully submitted,

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

225 Main Street
Newington, CT 06111

By: 

Christopher D. Imlay
Its General Counsel

BOOTH FRERET IMLAY & TEPPER, P.C.
5101 Wisconsin Avenue, NW
Suite 307
Washington, DC 20016-4120
(202) 686-9600

September 8, 1998